

Harding Lawson Associates

A Report Prepared for

Van Waters & Rogers Inc.
6100 Carillon Point
Kirkland, Washington 98033

EXHIBIT #1
WORK PLAN
PRELIMINARY STUDY AREA INVESTIGATION
BOISE, IDAHO

HLA Job No. 10987,404

by

S. Michelle Watson

S. Michelle Watson
Senior Geologist

Christopher R. Smith

Christopher R. Smith, P.G. 736
Principal Hydrogeologist

Harding Lawson Associates
7655 Redwood Boulevard
P.O. Box 578
Novato, California
415/892-0821

September 8, 1992

USEPA SF



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- Compliance with applicable or relevant and appropriate requirements;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume;
- Short-term effectiveness;
- Implementability;
- Cost;
- Community acceptance; and
- State acceptance.

The results of the remedial measure(s) development and evaluation will be incorporated into the Remedial Action Plan (RAP).

The RAP will 1) describe the alternative development and evaluation process, 2) identify and provide justification for the recommended remedial measures, 3) present the conceptual approach for implementation of the recommended remedial measure(s), 4) provide a schedule for implementation of the selected remedial measure(s), and 5) describe potential impacts to the environment and the surrounding community, regulatory or permit requirements, and other appropriate information.

4.0 SCHEDULE

Table 1 presents the Schedule and Table 2 presents a Deliverables List. Implementation of the work activities will begin within 4 weeks of the effective date of the Consent Order. The draft Phase I report presenting the work described in Section 3.0 will be submitted to the Department approximately 60 days following work completion. The draft Phase II report will be submitted to the Department following completion of the Phase II activities. The RAP will be initiated upon finalization of the Phase I and II Site Investigation reports. This schedule is dependent on access to undertake the work, the results of the investigation, and any data gaps that may be identified and addressed during completion of the investigation tasks outlined herein.


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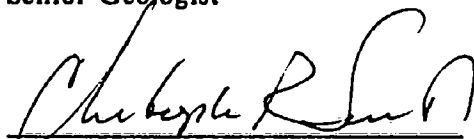
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Plate 2	Previous Investigation Well Locations

1.0 INTRODUCTION

Harding Lawson Associates (HLA) has prepared this Work Plan for Van Waters & Rogers Inc. (VW&R), Kirkland, Washington, to describe a planned investigation, implementation of interim remedial measures (as needed), and evaluation of source control or other remedial activities northwest (downgradient) of the Boise Towne Square Mall, Boise, Idaho, in the Preliminary Study Area (PSA; Plate 1). VW&R is one of the parties negotiating with the Idaho Department of Health and Welfare, Division of Environmental Quality (Department) concerning terms of a Consent Order regarding the PSA. VW&R and these other parties are referred to as Respondents in this Work Plan. This Work Plan has been prepared as an exhibit to the Consent Order between Respondents and the Department.

The objectives of this effort are to:

Phase I

- o Characterize the hydrogeology and groundwater chemistry through comprehensive evaluation of existing data and reports, including without limitation, the West Boise Well Survey, and other data collected during implementation of the Water Supply Order and Boise Mall Consent Order, and identify data gaps;
- o Identify potential sources of contamination;
- o Evaluate the extent of surface water, groundwater and soil contamination by Perc Compounds;
- o Further characterize the geology and hydrogeology by conducting a geophysical investigation;
- o Evaluate groundwater-surface water interaction;
- o Identify potential human health and environmental receptors and impacts to them; and
- o Develop a Phase II area-wide Work Plan.

Phase II

- o Conduct an investigation to resolve data gaps identified during Phase I; and
- o Evaluate human health and ecological risks associated with the presence of Perc Compounds.

Phase III

- o Evaluate the need for Interim Remedial Measures (IRMs);
- o If warranted due to the presence of Perc Compounds emanating from the property that is the subject of the Boise Mall Consent Order, evaluate IRMs alternatives; and
- o If warranted due to the presence of Perc Compounds emanating from the property that is the subject of the Boise Mall Consent Order and Perc Compounds present an imminent and substantial threat to human health and the environment, and if within Respondents' control, implement IRMs.

Phase IV

- o Evaluate final remedial actions and develop a Remedial Action Plan.

This Work Plan is structured as follows: Section 2.0 describes the background of the site and identifies previous investigations conducted in the PSA vicinity. Section 3.0 describes the scope of work for the Phase I through Phase IV activities. Sections 4.0 and 5.0 present the schedule and list of references, respectively. The procedures to be used for work activities outlined in this Work Plan are described in the Quality Assurance Project Plan (QAPP) (HLA, 1992a).

2.0 BACKGROUND

2.1 Preliminary Study Area

The PSA includes the theater property west of the 140 Milwaukee Avenue Area, and the area northwest of the Boise Towne Square Mall property. The PSA is generally bordered by Five Mile and Hampton Roads to the west, Sunflower Lane to the northwest, and the area between Emerald Street and the Union Pacific Railroad to the south (Plate 1). Perc has been detected in certain private wells in the PSA. The PSA is generally identified in the Water Supply Consent Order dated January 3, 1992, (Water Supply Order) between VW&R and the Department. When the PSA changes to the Study Area as the Water Supply Order and other activities progress, the boundaries described herein will be modified to reflect those changes.

2.2 Previous Investigations

Beginning in approximately 1987, the area west and north of the former VW&R location was commercially developed. Projects include the Boise Towne Square Mall, a portion of a Westpark Shopping Center Associates (Westpark) development, development by Walla Walla Shopping Center Associates, other retail stores, light commercial buildings, and high density housing. Since 1987, several environmental investigations have been performed in the vicinity. Data was collected at different times as part of the following investigations (Plate 2):

- Westpark Environmental Assessments conducted by Special Resource Management (SRM)
- Private well sampling downgradient of the Westpark site in July 1988 and April 1989 by SRM in cooperation with and at the request of the Department
- Westpark Remedial Action Plan written in January 1989 by SRM

- Quarterly groundwater monitoring by SRM pursuant to the January 13, 1989, Consent Order between the Department and Westpark
- Site assessment of Mervyn's (in the Boise Towne Square Mall) conducted in March 1989 by Dames and Moore
- Soil Sampling upgradient of and at the Pier I site in April and June 1989 by the Department
- Site Investigation conducted at the Baird Oil facility during the summer of 1990
- Site Assessment at Chen-Northern site conducted in August 1990
- Sampling of surface water (from the South Slough) and groundwater from private wells downgradient of the Westpark site in October 1990 (groundwater and surface water), July 1991, and April 1992 (surface water only) by the Department
- Site assessment of the Pier 1 Imports store in June 1991 by Professional Service Industries, Inc. (PSI)
- Installation of four groundwater monitoring wells in the Boise Towne Square Mall vicinity in July 1991 by Chen-Northern for the Department
- Environmental site evaluation of the Boise Towne Square Mall conducted in August 1991 by GZA GeoEnvironmental, Inc. (GZA)
- Soil gas and groundwater investigation in the vicinity of Pier 1 Imports conducted during September 1991 by HLA
- Soil boring investigation near Pier 1 Imports conducted during November 1991 by HLA
- Preliminary site investigation conducted at the Sinclair Station, Franklin and Cole Roads, in January 1992
- Monitoring well sampling at the Boise Towne Square Mall conducted by Industrial Health Incorporated-Environmental in June 1992.

A summary of each of the above investigations is presented in the *Work Plan, Boise Towne Square Mall Supplemental Investigation and Final Remediation* dated September 1992 (HLA, 1992b).

2.3 Site Hydrogeology

The shallow geology in the PSA vicinity consists of 50 to 150 feet of unconsolidated silt, sand, and gravel of Pleistocene Age, referred to as older terrace gravels, that have been reworked and deposited by the Boise River (*Dion, 1972*). These older terrace gravels comprise the shallow aquifers in the area.

Underlying the older terrace gravels and separated by an unconformity is the Glenns Ferry Formation. The Glenns Ferry Formation is Late Pliocene to Early Pleistocene Age and is composed of interbedded clay, silt, sand, fine gravel, and basalt up to 2,000 feet thick (*Dion, 1972*).

A shallow aquifer in the PSA vicinity is present under water table conditions at an approximate depth of 8 to 15 feet below ground surface (bgs). Localized groundwater recharge and discharge vary seasonally. Recharge generally occurs from the Ridenbaugh Canal, Farmers Lateral located south of the mall, and local agricultural irrigation during the irrigation season between April and October. However, localized groundwater discharge to the irrigation canals and sloughs has been observed in the area. Although the water table level and flow direction may fluctuate with the irrigation season, the predominant regional flow direction in this shallow aquifer is toward the northwest. The presence of a continuous aquitard separating the upper aquifer from the lower Glenns Ferry aquifer system is unconfirmed for the West Boise area. Well logs for the area suggest that the aquitard is laterally discontinuous.

The deep aquifer system lies in the sand, gravel, and basalt of the Glenns Ferry Formation and has been reported as a confined aquifer (*Mink and LeBaron, 1976*). The deep aquifer is recharged primarily from infiltration of precipitation and snowfall along the foothills and ridge areas and potentially from the shallow aquifer. Discharge from the aquifer is primarily from the Boise Water Corporation's production for domestic and

industrial use. Studies on the aquifer hydraulic characteristics indicate that the transmissivity is approximately 15,750 gallons per day per foot and has a coefficient of storage of 0.02 (*Mink and LeBaron, 1976*).

3.0 SCOPE OF WORK

The following sections describe work activities to be conducted under the various phases of work proposed for the PSA.

3.1 Phase I. Initial PSA Characterization

3.1.1 Task 1. Preliminary Characterization of Hydrogeology, Groundwater Chemistry, and Potential Sources of Contamination

The objective of Task 1 is to perform a preliminary characterization of the hydrogeology, groundwater chemistry, and potential sources of contamination in the PSA and identify data gaps. Respondents intend to meet this objective by conducting a comprehensive review of existing data reports in and near the PSA, including data generated during the Supplemental Mall Site Investigation undertaken pursuant to the Boise Mall Order, and the results of the West Boise Well Survey and other activities conducted during implementation of the Water Supply Work Plan.

3.1.2 Task 2. Evaluate Extent of Groundwater Contamination

The objective of Task 2 is to obtain data to evaluate the extent of groundwater contamination. Respondents intend to meet this objective by conducting a one-time sampling of selected existing wells and a soil gas survey in or near the PSA.

The field activities will be performed by a HLA geologist, hydrogeologist or field technician under the supervision of an Idaho registered geologist. Before field activities begin, the proposed work will be coordinated with appropriate owner/operator personnel, as well as utility companies.

Equipment decontamination, field work and waste material storage and disposal will be performed in accordance with procedures described in the QAPP (HLA, 1992a). Site safety procedures will be as described in the existing Site Safety Plan (HLA, 1991a). The QAPP will be submitted for review and approval by the Department. The Site

Safety Plan and addenda to the Site Safety Plan will be developed as necessary and submitted to the Department for review.

3.1.2.1 Groundwater Sampling

To develop an understanding of the extent and degree of Perc Compounds in groundwater, the existing well data and inventory information will be evaluated to identify domestic and monitoring wells appropriate for use in a one-time baseline sampling event. Specific sampling locations, methodologies, and rationale will be identified in a separate Groundwater and Surface Water Sampling and Analysis Plan. The sampling will be coordinated with the assistance of the Department and other persons conducting ongoing groundwater sampling programs within the PSA (e.g., Walla Walla Shopping Center Associates, Chen Northern). Groundwater and quality control samples will be collected in accordance with procedures described in the QAPP (HLA, 1992a).

3.1.2.2 Soil Gas Investigation

To supplement evaluation of the groundwater quality data obtained from the one-time groundwater sampling event, an area-wide soil gas investigation will be conducted in the PSA. The primary objective of the soil gas survey is to assess the extent of Perc Compounds in soil gas and to qualitatively evaluate the extent of Perc Compounds in soil and groundwater. As described in the *Soil Gas and Groundwater Investigation* report (HLA, 1991b), soil gas data can be used as a reconnaissance tool to evaluate the horizontal extent of groundwater contamination. In addition, soil gas concentrations will be evaluated to identify any anomalous patterns to assist in identifying other source locations and soil contamination. Specific sampling locations,

methodologies, and rationale will be identified in a separate Soil Gas Sampling and Analysis Plan.

3.1.3 Task 3. Additional Soils Investigation

3.1.3.1 Soil Borings

The objectives of Task 3 are to quantitatively evaluate the extent and source (where possible) of Perc Compounds, to assist in the characterization of the geology and hydrogeology within the PSA and the selection and design of remedial measures, and to interpret anomalous soil gas patterns. Additional soil borings may be drilled in the PSA to meet these objectives. Geophysical well logging may be used to assist in the lithologic characterization and definition of stratigraphic units (aquifer or aquitards). Specific procedures, rationale, and additional boring locations, if required, will be identified in a separate Soil Boring Sampling and Analysis Plan. Drilling and sampling techniques will be as described in the Department-approved QAPP (HLA, 1992a).

3.1.3.2 Laboratory Analytical Program

As described in the QAPP (HLA, 1992a), all soil and groundwater samples will be transported via overnight mail to Data Chem Laboratory, Salt Lake City, Utah, or other appropriate laboratory. The soil and groundwater samples will be analyzed for Perc Compounds using EPA Test Method 8010. Selected samples may also be analyzed for moisture content, grain size, and other organic and inorganic test methods, as appropriate.

3.1.4 Task 4. Geophysical Investigations

Depending on the hydrogeologic conditions encountered during drilling of the soil borings in Task 3 and the results of the geophysical investigation conducted during investigation of the Boise Towne Square Mall pursuant to the Boise Mall Order between

the Department and Respondents, seismic reflection and/or electrical resistivity surveys may be conducted to further characterize the geology and hydrogeology of the PSA, including delineation of the extent of any aquicludes or clay layers and to further investigate the subsurface stratigraphy. A separate Geophysical Sampling and Analysis Plan will be developed for this effort, if needed. Specific procedures, rationale, and locations will be identified in the Geophysical Sampling and Analysis Plan.

3.1.5 Task 5. Evaluate Groundwater-Surface Water Interaction

The objective of Task 5 is to evaluate the interaction between groundwater and surface water, the potential for surface water contaminant transport, and to develop an understanding of the extent and degree of South Slough Perc Compound contamination. This task will be accomplished by 1) evaluating the impact of the Ridenbaugh Canal and Farmers Lateral on shallow groundwater by qualitatively comparing monitoring well water levels with water levels of the canals; and 2) conducting a seepage study on the South Slough. The South Slough seepage study, coordinated with the groundwater sampling event described in Section 3.1.2.1, will include measuring slough water volumes and collecting water samples at previously identified cross-sections.

Sampling locations and methodologies will be described in the Groundwater and Surface Water Sampling and Analysis Plan. The data will be evaluated with the data collected during the Department's South Slough sampling on April 7, 1992. QC and surface water samples will be collected as described in the QAPP (HLA, 1992a).

3.1.6 Task 6. Identify Potential Human and Environmental Receptors

The objective of Task 6 is to identify potential human and environmental receptors of Perc Compounds. To meet this objective, the potential transport processes

associated with Perc Compounds detected in the PSA and identified in Task 5 will be evaluated and discussed with the Department to assess potential exposures.

3.1.7 Task 7. Phase I Investigation Report

Following completion of the Phase I investigation, a draft report will be submitted to the Department. The report will include data compiled during the investigation, maps and figures showing sampling locations, analytical results, identification of human and environmental receptors, identification of potential contaminant transport mechanisms, and evaluation of the data to identify data gaps and provide recommendations for additional work activities, if needed, to resolve data gaps. After receiving the Department's comments the draft Phase I Report will be finalized, then submitted to the Department.

3.1.8 Task 8. Phase II Work Plan

To address data gaps, contaminant transport mechanisms, and potential human health and environmental risks identified during the Phase I investigation, a Phase II Work Plan will be developed. The Work Plan will describe activities needed to complete the evaluation of area-wide Perc Compound contamination, hydrogeology, and risk assessment methodologies.

3.2 Phase II. Supplemental Investigation and Risk Assessment

3.2.1 Task 1. Supplemental Investigation

The objective of Task 1 is to further characterize the hydrogeology, extent and migration pathway(s) of Perc Compounds, and to resolve surface water and groundwater data gaps.

3.2.1.1 Installation of Additional Monitoring Wells

Monitoring wells will be constructed in areas where additional groundwater chemistry, aquifer, and surface water/groundwater systems interaction data are required for plume characterization or development of remedial measures. The rationale for the selection of the number, type, design, location, and sampling parameters of additional monitoring wells will be addressed in the Phase II Work Plan.

3.2.1.2 Evaluation of Aquifer Parameters

Aquifer hydraulic properties (transmissivity and hydraulic conductivity) will be evaluated by conducting an aquifer testing program. The aquifer test program will consist of step-drawdown tests, 24-hour constant rate discharge tests, and measurement of water-level recovery subsequent to each test. Aquifer tests will be performed in select wells that will be identified in the Phase II Work Plan and will be conducted in accordance with procedures described in the QAPP (HLA, 1992a).

3.2.1.3 Groundwater Monitoring

Water-level measurements will be collected from newly installed wells and selected existing monitoring wells in accordance with procedures described in the QAPP (HLA, 1992a). The water-level data will be used to calculate the groundwater flow direction and gradient.

To assess the extent of Perc Compounds in groundwater, HLA will collect groundwater samples from newly installed wells and selected existing monitoring wells in the Site. Groundwater and quality control samples will be collected and analyzed in accordance with procedures described in the QAPP (HLA, 1992a).

3.2.1.4 Surface Water Monitoring

Depending on the results of Phase I activities, additional South Slough monitoring may be conducted to identify groundwater contribution to and from the slough, and

potential chemical transport mechanisms. Monitoring of water levels and potential groundwater contribution of the Ridenbaugh Canal, Farmers Lateral, or other surface water sources may be conducted. The rationale, methodology, and duration of the monitoring will be presented in the Phase II Work Plan.

3.2.2 Task 2. Evaluate Contaminant Transport Mechanisms

The potential contaminant transport mechanisms identified during the Phase I investigation will be evaluated using data collected during the Phase II field work. Groundwater flow rates, chemical degradation, potential partitioning, and other factors that may influence chemical fate and transport will be evaluated and discussed. A conceptual model of the flow regimes and chemical fate and transport mechanisms will be developed as part of this task.

3.2.3 Task 3. Risk Assessment

The objective of Task 3 is to evaluate potential risks to human health and/or the environment that may be posed by the presence of Perc Compounds in the PSA. To meet this objective, the results of the Phase I and II investigation will be evaluated using Department-approved risk assessment methodologies.

A risk assessment (RA) will be conducted to assist in guiding future activities for the PSA. The specific risk assessment methodology and rationale, similar to those identified in the Mall Order Risk Assessment Plan, will be identified in the Phase II Work Plan which will be submitted to and approved by the Department prior to commencing work.

3.2.4 Task 4. Phase II Report

Following completion of the Phase II investigation, a draft report will be submitted to the Department. The report will include data compiled during the

supplemental investigation and risk assessment. After receiving the Department's comments the draft Phase II Report will be finalized, then submitted to the Department.

3.3 Phase III. Evaluate and Implement Interim Remedial Measures

The objectives of Phase III activities are to determine the need for interim remedial measures (IRMs), evaluate alternative IRMs and implement IRMs as may be needed to minimize Perc Compound contaminant transport. IRMs may include migration control at the leading edge of the Perc Compound contaminant plume and/or where surface water and groundwater interact, modification of the existing Westpark groundwater pump and treat system, or other IRMs as may be needed to address other identified Source Locations. The IRMs will be evaluated for cost effectiveness, applicability to specific PSA conditions, and ability to quickly and effectively minimize Perc Compound contaminant transport. A separate IRM Work Plan(s) describing selected IRMs will be developed and submitted to the Department, as appropriate.

3.4 Phase IV. Evaluate and Propose Remedial Measures

The objective of Phase IV is to evaluate the need for and recommend additional activities for final Perc Compound remediation in the PSA. If the PSA investigation indicates remedial action is warranted, remedial measures will be selected and screened on the basis of the effectiveness, implementability, and order-of-magnitude cost. On the basis of the results of the screening process, selected alternatives will be developed and retained for detailed analysis. The detailed analysis will follow the general guidelines outlined in the EPA's Feasibility Study guidance document (*U.S. EPA, 1988*) which suggests the following nine evaluation criteria:

- o Overall protection of human health and the environment;

- Compliance with applicable or relevant and appropriate requirements;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume;
- Short-term effectiveness;
- Implementability;
- Cost;
- Community acceptance; and
- State acceptance.

The results of the remedial measure(s) development and evaluation will be incorporated into the Remedial Action Plan (RAP).

The RAP will 1) describe the alternative development and evaluation process, 2) describe the conceptual model and the results of the risk assessment, 3) identify and provide justification for the recommended remedial measures, 4) present the conceptual approach for implementation of the recommended remedial measure(s), 5) provide a schedule for implementation of the selected remedial measure(s), and 6) describe potential impacts to the environment and the surrounding community, regulatory or permit requirements, and other appropriate information.

4.0 SCHEDULE

Table 1 presents the Proposed Schedule and Table 2 presents a Deliverables List. Implementation of the work activities will begin within 4 weeks of the effective date of the Consent Order. The draft Phase I report presenting the work described in Section 3.0 will be submitted to the Department approximately 60 days following work completion. The draft Phase II report will be submitted to the Department following completion of the Phase II activities. The RAP will be initiated upon finalization of the Phase I and II Site Investigation reports. This schedule is dependent on access to undertake the work, the results of the investigation, and any data gaps that may be identified and addressed during completion of the investigation tasks outlined herein.

5.0 REFERENCES

- Baldwin, Joe, 1991. *Westpark Groundwater Sampling and Analysis Protocol*. Memorandum to Sally Goodell, State of Idaho Division of Environmental Quality, Boise, Idaho. 14pp.
- Chen-Northern, Inc., 1991. *Letter to Rob Howarth, Division of Environmental Quality, Idaho Department of Health and Welfare*. July 23.
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United States Environmental Protection Agency (EPA), 1988. *Guidance for Conducting Remedial Investigation/Feasibility Studies under CERCLA.* Interim Final. EPA 540/G-89/001.

TABLES

Table 2. Deliverables List

Referenced Page Number	Deliverable
2	QAPP
7	Site Safety Plan
8	Groundwater and Surface Water Sampling and Analysis Plan
9	Soil Gas Sampling and Analysis Plan
9	Soil Boring Sampling and Analysis Plan
10	Geophysical Sampling and Analysis Plan
11	Phase I Investigation Report
11	Phase II Work Plan
14	Phase II Report
14	IRM Work Plan
15	RAP

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**EXHIBIT #1
WORK PLAN
PRELIMINARY STUDY AREA INVESTIGATION
BOISE, IDAHO
SEPTEMBER 8, 1992**

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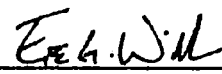
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6 copies	Idaho Department of Health and Welfare Division of Environmental Quality 1410 North Hilton Boise, Idaho 83706-1253 Attention: Sally Goodell	6-11
2 copies	Boise Mall Development Company c/o Price Development Company 35 Century Park Way Salt Lake City, Utah 84115 Attention: Rex Frazier, President	12-13

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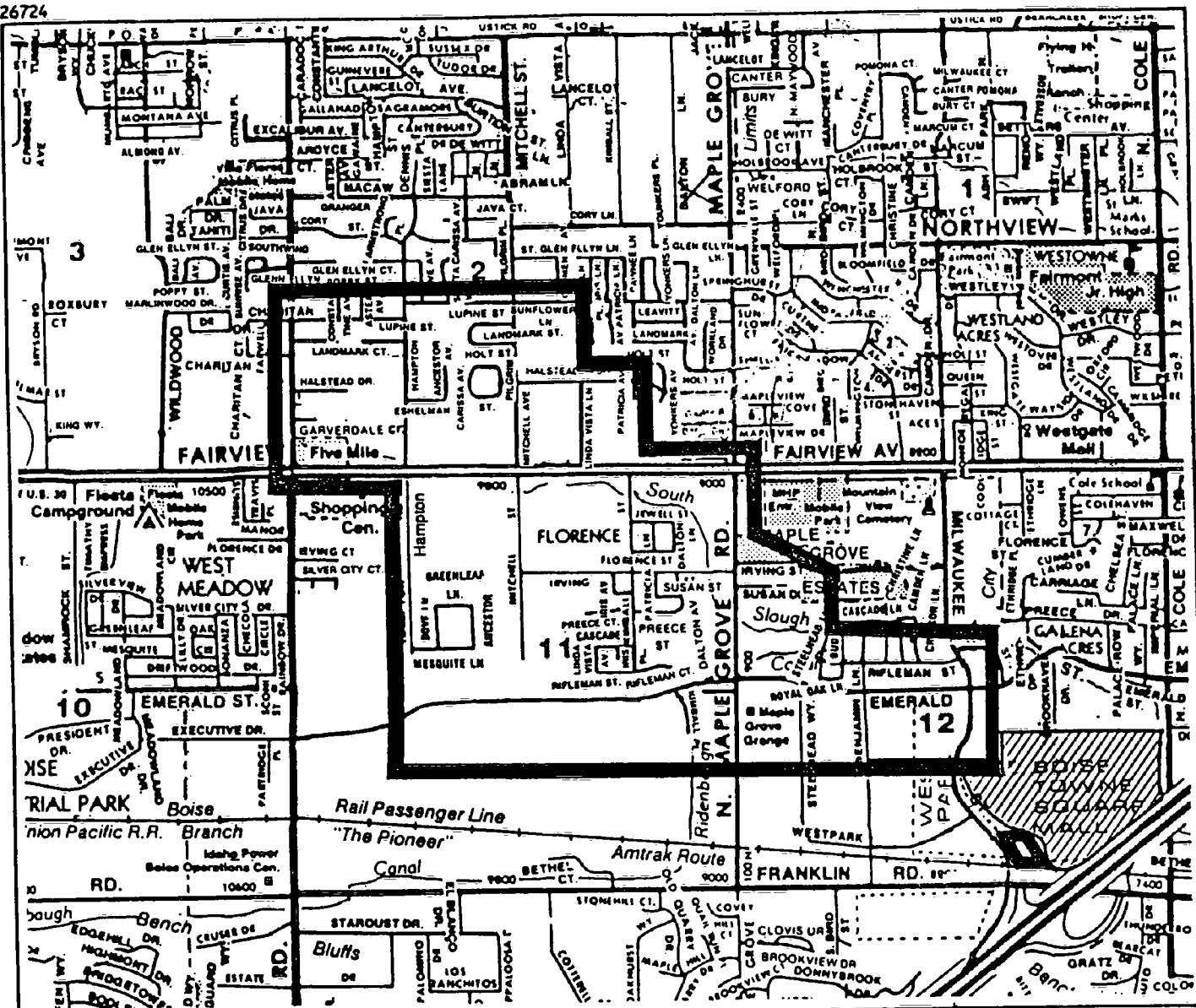
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QUALITY CONTROL REVIEWER



Eric G. Williams
Senior Geologist

ILLUSTRATIONS



REFERENCE: Boise Metro Map, Published by Hunt Enterprises, Boise

EXPLANATION



Mall Investigation Area



Preliminary Study Area

0 1/2 1
SCALE IN MILES



052192SM

PLATE



Harding Lawson Associates
Engineering and
Environmental Services

Preliminary Study Area
Work Plan
Preliminary Study Area Investigation
Boise, Idaho

DRAWN JOB NUMBER
AG 10987 404

APPROVED
SMW

DATE
4/92

REVISED DATE

1

